SECTION 13090 - RADIATION PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of radiation protection work is indicated on the drawings. This includes, but is not limited to, the following:
   1. Lead-lined gypsum board.
   2. Lead-lined doors and frames.
   3. Lead-protected control windows in dental operatories

1.3 QUALITY ASSURANCE

A. National Bureau of Standards: Comply with requirements of National Council on Radiation Protection and Measurement (NCRP) Report No. 49, "Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies up to 10 MeV", as applicable to this work.
   1. Comply with requirements of local requlatory agencies where standards and criteria exceed NCRP Report No. 49.

B. Single Source Responsibility: Provide Radiation protection materials, equipment, and accessories produced as standard products of a single manufacturer regularly engaged in the production of X-ray shielding materials.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical product information and installation instructions for each item of radiation protection and accessories.

1.5 DELIVERY, STORAGE AND HANDLING

A. Lead-Lined Door Frames: Comply with requirements of applicable Division-8 sections for Steel Door Frames.

B. Lead-Lined Wood Doors: Comply with requirements of applicable Division-8 sections for Wood Doors.

C. Lead-Lined Gypsum Board: Comply with requirements of applicable Division-9 sections for gypsum drywall.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Lead Sheet: FS QQ-L-201, Grade C, thickness as indicated.

B. Lead Glass: FS DD-G-451, Type I, polished plate with a lead equivalent not less than that of system in which it is installed.

C. Lead-Lined Gypsum Board: ASTM C 36, and as follows:
1. Sheet Size: Width and length as required for support spacing and to prevent cracking during handling.
2. Thickness: Not less than 5/8 inch (16 mm), unless otherwise indicated.
a. Laminate a single thickness of unpierced sheet lead to back of gypsum board units. Provide 2-inch (50 mm) wide lead strips for lapping at joints.

D. Accessories and Fasteners: Manufacturer's standards, maintaining equivalent protection as system.

E. Lead-Headed Nails: Size, type, and design as recommended by manufacturer of protection system.

F. Lead-Lined Wood Doors: Comply with applicable requirements of Division-8 sections for Wood Doors.

1. Fabricate doors of solid care flush construction with one or more continuous unpierced lead sheets to make up total lead thickness as indicated on the drawings. Apply lead sheet constructed in the core or between the care and cross-banding at the manufacturer's option. Assemble lead lining and core with poured lead fasteners or steel bolts. Space lead dowels not more than 1 1/2 inches (38 mm) from door edge and approximately 8 inches (200 mm) on center. Countersink bolt heads and cover with poured lead.
2. Shield cutouts for locksets with sheet lead lapping lead lining of locksets and door lining, of equal thickness as used in door.
3. Furnish face veneer (birch) of face quality and finish as required for other interior flush wood doors.

G. Lead-Lined Door Frames: Comply with requirements of applicable Division-8 sections.

1. Provide additional reinforcements and internal supports to adequately carry the weight of lead-lined doors. Perform such work prior to installation of lead lining.
2. Line the inside of frames with single unpierced strip of sheet lead of not less than same thickness as doors and walls in which frames are used. Form lead shields to match contour of frame, continuous in each jamb and across head.

Form lead shields around areas prepared to receive hardware. Fabricate lead lining wide enough to maintain an effective lap with the lead of adjoining shielding units.

H. Control Windows: Furnish control viewing windows where indicated on drawings. Fabricate window frame of cold-rolled steel or aluminum extrusions lead sheet lining not less than the same thickness of the lead protection in the system. Form the frame sill with horizontal trapped or baffled opening for voice passage. Construct frame to overlap lead glass perimeter not less than 3/8 inch (10 mm) and provide removable glass stops.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lead-Lined Gypsum Board: Install lead-lined gypsum board over supports as indicated.
1. Refer to Division-9 sections for metal furring and supports.
2. Predrill gypsum board or drill pilot holes for fasteners to prevent deformation of lead-headed fasteners and distortion of laith.
3. Apply gypsum board with long edged parallel to supports and lead lining wide and the same thickness as gypsum board lead lining to face of supports with wire nails along the outer edge.
4. Nail gypsum board to supports with lead-headed nails spaced as recommended by board manufacturer. Drive nail heads slightly below the exposed surface.

3.2 BUILT-IN-ITEMS

A. Lead-Lined Door Frames: Refer to Division-8 sections for installation requirements of lead-lined metal door frames.

B. Lead-Lined Doors: Refer to Division-8 sections for installation requirements of lead-lined wood doors.

1. Finish hardware is specified in section "Builder's Hardware".

2. Hang doors to have a clearance of 1/16 inch (2 mm) at sides and top and minimum adequate clearance at bottom.

C. Built-In Items: Where other built-in items penetrate lead linings, provide lead shields as required to maintain continuity of shielding. Install in accordance with manufacturer's instructions.

3.3 DESIGNATING PLAQUES

A. Designating Plaques: Provide designating plaques in rooms. Indicate on plaques locations where shielding thickness of lead changes or is not continuous. Fabricate plaques form aluminum, plastic laminate or other approved material. Provide lettering on plaques as indicated on drawings or as directed by the health physicist. Provide plaques of sufficient size to contain information required.

1. Dental X-Ray and Examination Rooms: Provide one sign for each room indicating thickness in millimeters of sheet lead insulation and total lead equivalent protection in millimeters of partitions, doors and lead-lined shield.
2. Rooms with Non-Insulated Partitions: Provide one sign for each lead insulated partition in a room for which all partitions are not insulated. Indicate height of sheet lead above floor or indicate partition has been insulated full height. Indicate thickness expressed in millimeters of sheet lead protection and total lead equivalent protection expressed in millimeters.

3.4 TESTING

A. After X-ray equipment has been installed and placed in operating condition, radiation shielding will be tested by a health physicist, certified by nationally recognized agency, at the Owner's expense.

B. Testing will performed in accordance with the requirements of NBS Handbook H-76 "Medical X-Ray Protection Up to Three Million Volts". Decision of acceptability by health physicist shall be binding on contractor.

C. Repair or replace defective work, including other work affected thereby and conduct additional testing to the satisfaction of health physicist, at no additional expense to the Owner.

END OF SECTION 13090